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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/825,217	04/16/2004	Hiroki Kusakabe	43888-299	8308

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EXAMINER	
WILLIAMS, SHERMANDA L	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 01/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/825,217	KUSAKABE ET AL.	
	Examiner	Art Unit	
	Shermanda L. Williams	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04/16/2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

FUEL CELL WITH RECOMBINATION CATALYST

Examiner: Williams S.N. 10/825,217 Art Unit: 1745 January 18, 2006

Oath/Declaration

The specification to which the oath or declaration is directed has not been adequately identified. See MPEP § 602. The application containing the specification referred to by the Declaration has not been identified by serial number in the Declaration.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "1" and "3" have both been used to designate the membrane electrode assembly and the current collector plates respectively. However, upon review of Figure 1, characters "1" and "3" denote the same component. This renders the figure unclear. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

In addition to Replacement Sheets containing the corrected drawing figure(s), applicant is required to submit a marked-up copy of each Replacement Sheet including annotations indicating the changes made to the previous version. The marked-up copy must be clearly labeled as "Annotated Sheets" and must be presented in the amendment or remarks section that explains the change(s) to the drawings. See 37 CFR 1.121(d)(1). Failure to timely submit the proposed drawing and marked-up copy will result in the abandonment of the application.

Specification

The applicant is reminded of the procedures governing the use of trademarks in an application. It should be capitalized wherever it appears and be accompanied by the generic terminology. Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The specification is objected and the following corrections are requested. In the last sentence of paragraph 13, it appears that "valve" was inserted rather than the intended "value". In the last sentence of paragraph 50, the phrase "about after 5 minutes" is unclear.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5, 6, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 2003/0039869) in view of Bailey et al. (US 6,638,650). Murakami et al. discloses a method for detecting an abnormality in a fuel or multiple fuel cells after a predetermined time period from the stoppage of the fuel cell operation. The reference teaches a fuel cell having a solid polymer electrolyte membrane interposed between an anode and cathode electrode and separators inserted. See Figure 2. The structure includes ducts connected to supply the reacting fuel and oxidant gases to the fuel cell. The operation of the fuel cell is halted by the stopping the supply of air from the air compressor and stopping the hydrogen gas by closing the fuel supply valve for the associated ducts. Therefore, both fuel gas and oxidant gas flow to the fuel cell is stopped. See paragraph 45. The behavior of the fuel cell voltage upon stopping the fuel cell (in the absence of an abnormality) is the gradual decrease in cell voltage to zero. If an abnormality (i.e. holes in the polymer electrolyte membrane or holes in the separators) does exist within the fuel cell, the voltage drop will be more rapid. See Paragraph 46.

Furthermore, Murakami et al. teaches the establishment of a "predetermined value" for the electric output or cell voltage by averaging the cell voltages detected (after the elapse of the predetermined time period after stoppage of the fuel cell). Upon comparing the individual cell voltages to the predetermined value, the cell with the abnormality can be identified. The comparison of the individual cell voltage behavior to the predetermined value occurs as a drop in voltage observed over time or the cell's

"electric output change over time" after stopping the reactant gas flow. The time interval being the amount of time it takes for the observed voltage to reach zero. See Figure 3.

Murakami et al. discloses the "rate of voltage decrease" or the speed of the decrease in the fuel cell voltage after stoppage of the cell operation as the "electric output" to be evaluated to determine the presence of leakage or abnormality. See Paragraph 13. Murakami et al. does not disclose the introduction of another or inert gas to one of the electrodes after the stoppage of the supply of either the fuel gas or oxidant gas.

Bailey et al. (US 6,638,650) discloses a method for detecting transfer leaks in fuel cells and fuel cell stacks. Bailey et al. teaches the introduction of an inert or "other gas" to the fuel cell via the fuel gas or the oxidant gas manifold. See Column 3 Line 68. The introduction of the inert gas to the fuel gas manifold or "electrode" of the fuel cell assembly allows one to test for leaks from the fuel gas side to the oxidant gas side. See Column 4 Line 28 and Column 4 Line 48. Bailey et al. further teaches the introduction of an "inert gas" to the fuel cell in order to amplify or make the voltage drop of the fuel cell unit or stack under evaluation for leakage measurable. See Column 9 Line 60. It is also disclosed in the reference that the "inert gas" may be argon, helium, nitrogen, or carbon dioxide. See Column 7 Line 15.

Bailey et al. also teaches the method of comparing the voltage of the fuel cell or cell stack under evaluation for leakage to a predetermined or reference cell voltage to conclude the presence of an abnormality or leak. If the cell voltage or "electric output" of the fuel cell or cell stack under evaluation is significantly "less than the predetermined

value" or reference cell voltage, then a leak is plausible. Therefore, it would have been obvious to one having ordinary skill in the art to modify Murakami et al. in view of Bailey et al. to produce a fuel cell method of operation that stops the flue gas and oxidant gas flow to the fuel cell and then introduces an inert or other gas to the fuel cell to enhance changes in the electric output of the cell over time. As well, it would have been obvious in view of Murakami et al. and Bailey et al. to compare the fuel cell electric output to a predetermined value to see if the observed electric output is less than the predetermined value. Due to the teachings of Murakami et al., it would have obvious to one having ordinary skill in the art at the time of the invention to chose the cell voltage or the rate of cell voltage decrease as the electric output to be observed and compared. See Paragraph 13 and 14. It would also have been obvious one having ordinary skill in the art to introduce the "other gas" to the fuel cell electrode (as taught by Bailey et al.) to determine leakage from the fuel gas side to the oxidant gas side. See Column 4 Line 28 and Column 4 Line 48.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 2003/0039869) and Bailey et al. (US 6,638,650) as discussed above, and further in view of Knights et al. (US 6,517,962). Knights et al. discloses fuel cell anodes structures for voltage reversal tolerance. The reference teaches the conventional cathode electrode having carbon supported platinum catalyst applied to a porous carbon fiber medium and an anode electrode employing a conventional carbon-supported platinum-ruthenium catalyst alloy. See Column 9 Line 57. These materials are commonly used in solid polymer fuel cells.

The use of a predetermined value that is the approximate voltage value at which a metal catalyst of one of the electrodes to be supplied with said fuel gas starts to melt would have been obvious to one having ordinary skill in the art at the time of the invention. The utilization or selection of this voltage value as the predetermined voltage value allows for protection of the catalyst of the electrode. The protection allows for the identification of cell abnormalities or leakage prior to causing serious catalyst damage in the cell.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 2003/0039869) and Bailey et al. (US 6,638,650) as discussed above, and further in view of Knights et al. (US 6,492,043). Knights et al. discloses a method for detecting a leak within a fuel cell or multiple fuel cells, preferably the solid polymer fuel cell type. Knights et al. teaches the technique of introducing a tracer or other gas that is not chemically reactive as a method to identify leaks within a fuel cell. See column 4 Line 66. The reference further discloses that "methane" may be selected as a tracer or other gas to be introduced to the fuel cell for the purpose of leak detection. See Column 5 Line 3. Knights et al. also discloses the introduction of the tracer to one fluid supply passage and then monitoring the other supply fluid passages for the presence of the tracer. The presence of the tracer in a fluid supply passage (fuel gas side or oxidant gas side) that was not initially injected with the tracer is an indication of leakage. See Column 5 Line 55. Therefore it would have been an obvious to one having ordinary skill in the art at the time of the invention to choose an inert gas or methane as taught

by Knights et al. to enhance the electric output of the fuel cell under evaluation for leakage.

Claims 7, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 2003/0039869) and Bailey et al. (US 6,638,650) as discussed above, and further in view of Stuhler (US 2004/0234826). Stuhler discloses a method for localizing a gas leak in a fuel cell system. This reference teaches stopping the supply of fuel gas and oxidant gas to the cell prior to the introduction of the inert gas. See Paragraph 35. Stuhler teaches that an inert gas such as nitrogen is introduced to the fuel cell system for a predetermined first period of time. See Claim 6. The electric output of the cell is evaluated after the elapse of this time period. Stuhler teaches that this first period of time is selected to be between 10 seconds and 5 minutes thereby encompassing the range of "1 to 4 minutes after the introduction of the inert gas. See paragraph 42 and 43. The elapse of the predetermined time period is necessary to allow residual operating gases in the fuel cell to be consumed or to allow the inert gas to diffuse throughout the space into which it has been introduced. Therefore at the time of the invention, it would have been obvious matter of design choice to one having ordinary skill in the art to evaluate the fuel cell electric output 1 to 4 minutes after introduction of the other gas nitrogen. The motivation of the time elapse after the introduction of the nitrogen is to allow the proper time passage for the inert gas to move throughout the space of the fuel cell.

Stuhler also discloses the use of an evaluation unit or "control device" to record and display the electric output of a single fuel cell or a group of fuel cells to be evaluated

for leakage. This increases the ease with which a defective cell or group of cells can be identified. See Paragraph 67 and 68. The recorded electric output values are compared to a predetermined value for the purpose of determining if the recorded value is greater than or "not greater than" the predetermined value. If the recorded electric output or voltage is not greater than the predetermined value, the cell is defective. See Paragraph 69. Therefore at the time of the invention, it would have been obvious to one having ordinary skill in the art to produce a polymer electrolyte fuel cell comprising a plurality of unit cells each comprising a pair of electrodes with polymer electrolyte membrane between them and electroconductive separators on either electrode to generate electricity. The polymer electrolyte fuel cell generates electricity with the supply of a fuel gas to one electrode and an oxidant gas to the other electrode. Furthermore, it would have been obvious to one having ordinary skill in the art at the time of the invention to include a "control unit" or an evaluation unit as taught by Stuhler for the comparison of a recorded electric output to a predetermined value to determine if the recorded value is "not greater than" the predetermined value and therefore a defective fuel cell or group of cells exist.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (272) 571-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and rotating Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (272) 571-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PATRICK JOSEPH RYAN
SUPERVISORY PATENT EXAMINER